

**Example 7.33.** A LTI system is **causal** and has the system function

$$H(s) = \frac{1}{(s+2)(s^2+2s+2)}.$$

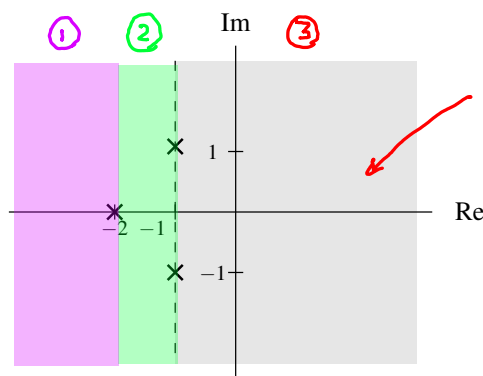
Determine whether this system is BIBO stable.

*Solution.* We begin by **factoring  $H$**  to obtain

$$H(s) = \frac{1}{(s+2)(s+1-j)(s+1+j)}.$$

(Using the quadratic formula, one can confirm that  $s^2 + 2s + 2 = 0$  has roots at  $s = -1 \pm j$ .) Thus,  $H$  has **poles at  $-2$ ,  $-1 + j$ , and  $-1 - j$** . The poles are plotted in **Figure 7.21**. Since the system is **causal** and all of the poles of  $H$  are in the **left half of the plane**, the system is **stable**.

Three possibilities exist for the ROC of  $H$  as shown.



↑ Since causal, ROC of  $H$  is RHP

This ROC is RHP.  
This ROC contains imaginary axis.

Figure 7.21: Poles of the system function.